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Supporting Information for

Rupture Characteristics of Major and Great ($M_w \geq 7.0$) Megathrust Earthquakes from 1990-2015: II. Depth-Dependence

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Additional Supporting Information (Files uploaded separately)

Supplement S1 – Figures S3 to S36: Finite-fault models for 17 subregions with source parameter relations for all events in each region

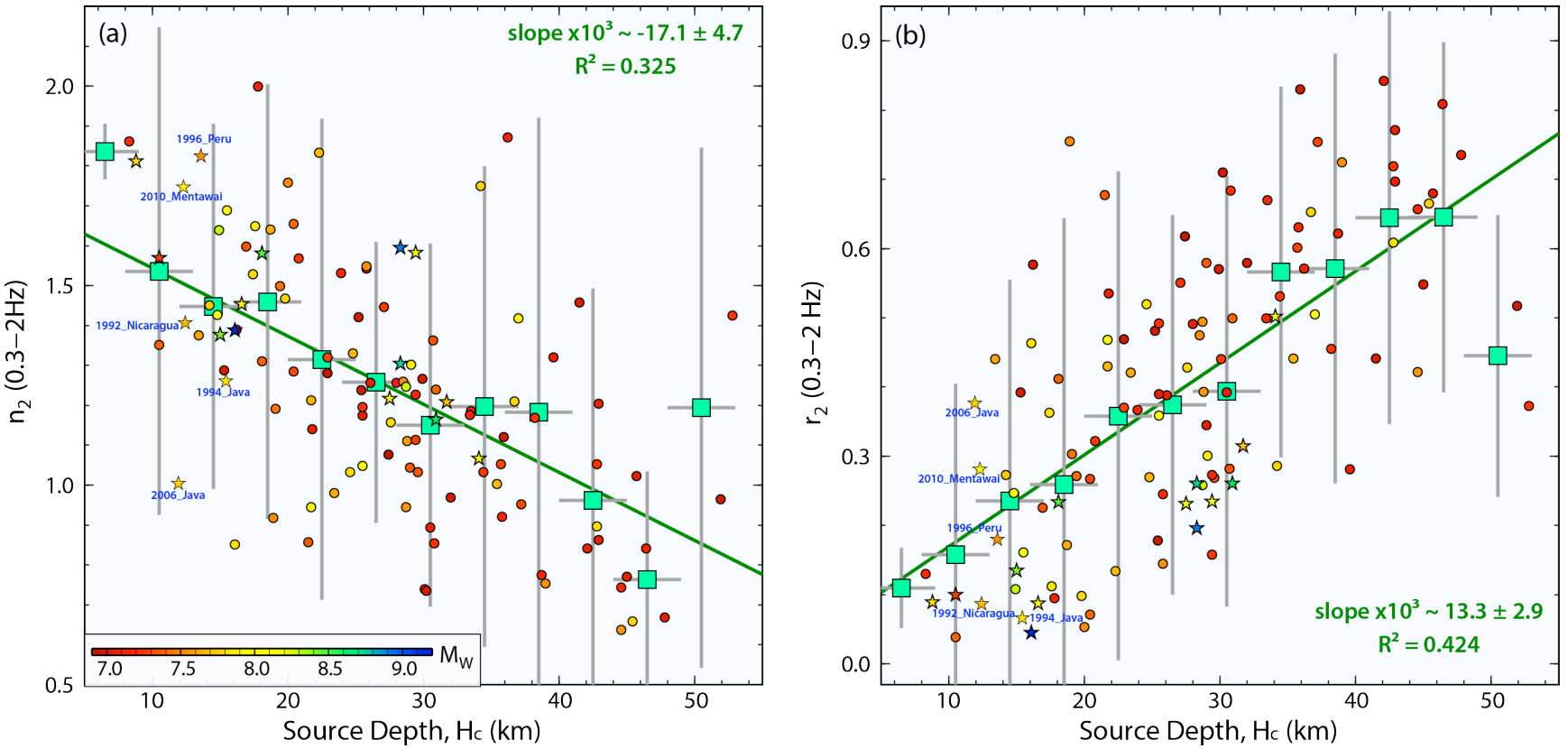

Figure S1. Regression slopes and correlation coefficients of the (a) 0.3-2 Hz spectral slop measures, and (b) ratios of high-frequency (0.3-2 Hz) radiated energy over total radiated energy, as functions of average depth of the slip distribution from the finite-fault source models. Colors of circles and stars denote M_w. The squares show the average value over each 5 km depth range as indicated by the horizontal gray lines. The vertical gray lines indicated the range of 2σ, where σ is the standard deviation. The coefficient of determination R^2 is shown for each case.

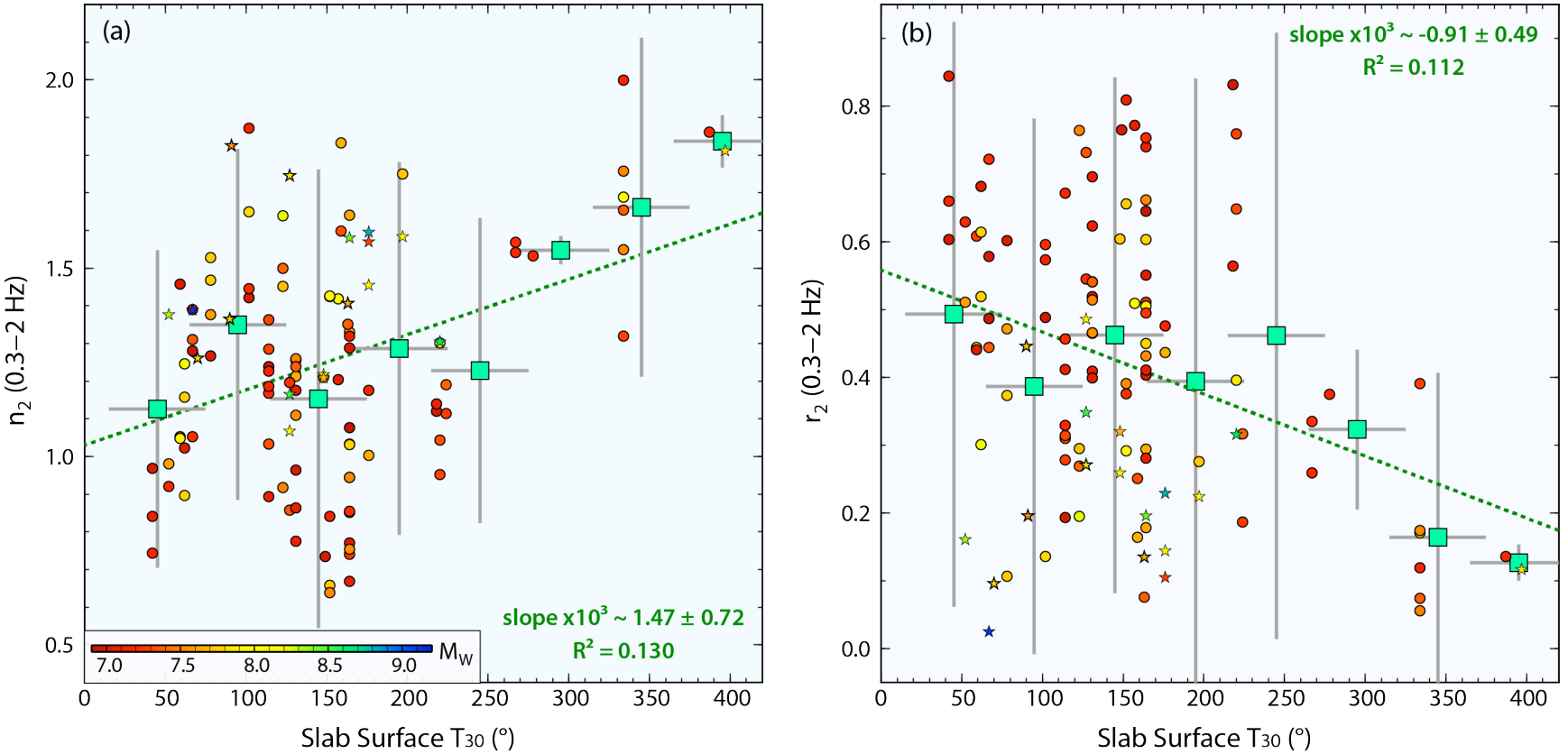

Figure S2. Regression slopes and correlation coefficients for the (a) 0.3-2 Hz spectral slope measures, and (b) ratios of high frequency (0.3-2 Hz) radiated energy over total radiated energy, as functions of estimates of surface temperature of the subducting slab at 30 km depth [Syracuse *et al*., 2010]. Symbols sizes are scaled with M_w from 7 to 9. The squares show the average value over each 50° range depth range as indicated by the horizontal gray lines. The vertical gray lines indicated the range of 2σ, where σ is he standard deviation. The coefficient of determination R^2 is shown for each case.

Description for supplementary file of regional faulting parameters.

Supplement S1. Finite-fault model information, source spectra, earthquake slip distributions versus depth, and source parameter relationships with depth for 17 regions sampled by out data set of 114 major and great earthquakes. For each region a first page shows the slip distributions from finite-fault inversions for events in that region are shown on a map with true relative placement of the slip and common slip scale. The average source spectra and spectral fitting parameters described in the text are shown for all events in each region, along with the distribution of slip and seismic momen versus depth for each event. The second page shows the depth distribution of scaled centroid time, moment-scaled radiated energy, apparent stress, stress drop from the variable slip finite-fault model, slopes of the high-frequency spectral amplitude curves, and the high-frequency/total radiated energy ratio. Dashed lines indicate the average values for the whole population for each parameter.